THE INFLUENCE OF ENVIRONMENTAL RESOURCES SPECIFIC TO THE CULTIVATION YEAR OVER THE GRAPEVINE GROWTH AND YIELD

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Abstract

The ecological offer holds an important role in establishing the grapevine areas. The pedo-climatic conditions influence the intensity of the physiological and biochemical processes inside the plant, determine the length of the vegetation period, influence the hydro-mineral feeding system, the quality of crops, and offer singularity to the grapes and wines obtained on a certain area, expressed by the specificity of the viticultural area. Grapevine cultivation with superior productive results requires, besides the biological characteristics of the cultivated soil, the continuous appreciation of the ecological favourableness of the space used for this purpose, in order to identify and then apply the most appropriate counter measures according to the variation of the pedoclimatic conditions.

Grapevines are multiannual plants, hence the significant importance of the influence of the annual ecological offer over production, especially its quality. The knowledge of morphological, physiological and biochemical particularities determined by the pedoclimatic conditions is important for the elaboration and support of viticultural technical activities.Grapevines have the ability to adapt to various environmental conditions, however extremely high temperatures (over 35^0 C) or heatwaves often associated with drought may affect the grapevine physiology and yield.

This study was focused on the influence of the environmental resource variation over the intensity of certain physiological processes (photosynthesis, transpiration, stomatal conductance), as well as over the growth and fruit bearing of certain grapevine varieties cultivated in Dealurile Craiovei viticultural region.

Key words**: **environmental resources, grapevine, growth, stomatal conductance

INTRODUCTION.

The areas favourable to grapevine cultivation have most various pedo-climatic conditions which, correlated with the ecological requirements of varieties and parent stocks, are key elements in obtaining high level production of grapes and wine in terms of both quantity and quality.

Vitis vinifera (L). is a species sensitive to climate change,(Battaglini A. et al 2009) Climate is a key determinant of land that affects annual productions, grape quality traits and, determines resource management in the viticultural agroecosystem (Gilda- Diana Buzatu, L. Mărăcineanu, 2015, Tissot C. et al 2017). Ecoclimatic conditions influence the duration of the vegetation period, influence the intensity of the physiological and biochemical processes inside the plant, determines the growth and fruiting and gives uniqueness to the grapes and wines obtained in a certain area (Biasi et al 2016,. Bora et al, 2014) For this reason, obtaining superior productive results

requires continuous assessment of the ecological favorability of the territory used for grapevine cultivation - Cichi Daniela et al (2006, 2016), Costea D et al (2008,2015). In this way, the most appropriate technological measures can be identified and applied depending on the variation in ecoclimatic conditions(Lung M. et al 2012, Ollat N. et al, 2016, Teil, Geneviève , 2016)

MATERIALS AND METHODS

In accordance with the research topic proposed, the observations and determinations focused on: monitoring climatic factors for the evaluation of the favourableness of the study year (2021) and studying the influence of the ecoclimatic resources characteristic to the study years on the bioproductive parameters. The observations and determinations were carried out in the wine-growing center Simnicu de Sus, a wine-growing center located in the demarcated area for the production of wines with the Controlled Designation of Origin (DOC) "Banu Mărăcine". in a 14-year-old vineyard, in the Tâmâioasă românească variety, The effect of the varied climatic resources on the studied varieties was evaluated through the analysis of the biological indicators: shoot growth and maturation bud viability; and bioproductive parameters – evolution of weight, volume, acidity and sugar content of berries during ripening . .

RESULTS AND DISCUSSIONS

Evaluation of climate conditions during the experimental period. Historical average weather data for the period 2009-2021 and from the study period were provided by WorldWeatherOnline.comt (fig. 1-6)

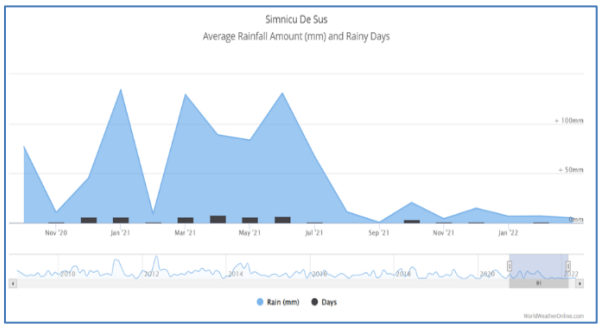

Figure 1- Average rainfall amount and rainy days- Șimnicu de Sus during the experimentation period

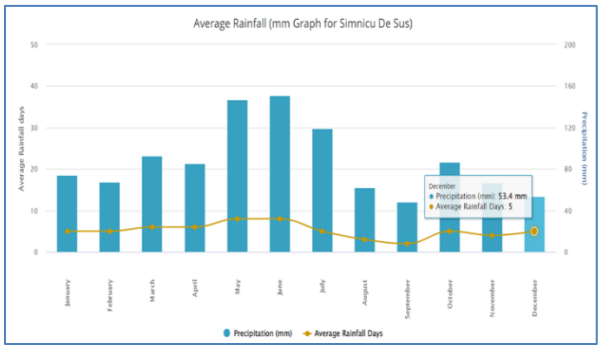

Figure 2- Average rainfall (2009-2021)

Studying the amount of precipitation from the year 2021, it is found a larger amount of precipitation in the first part of the vegetation period (April-June 2021 - figure 1) and the lack of useful precipitation (over 10 mm) in the ripening period (August-September)). Lower values are also found compared to the multi-year average (2009-2022) (figure 2)

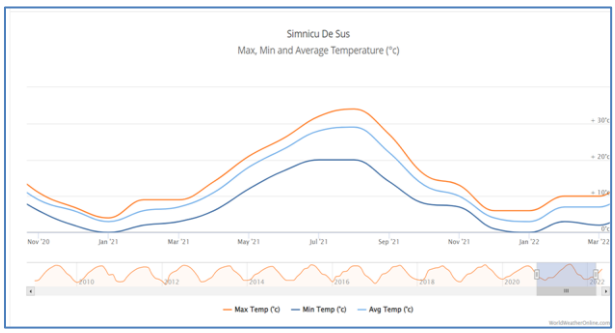

Figure 3- Monthly average of maximum, average and minimum temperatures in Șimnicu de Sus- during the experimentation period

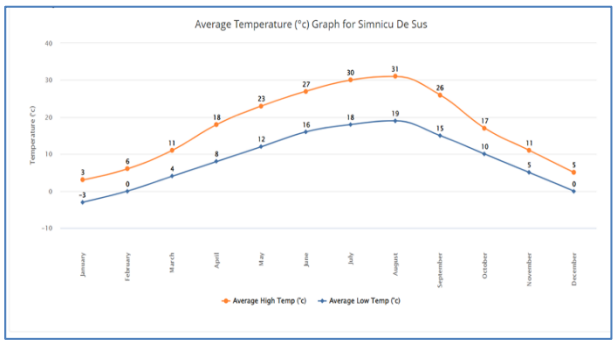

Figure 4- Average temperature (2009-2021)

Comparing the average temperatures from the year 2021 with the multi-year average, higher values of temperatures are found, especially in the period June - September (fig 3 and fig 4)

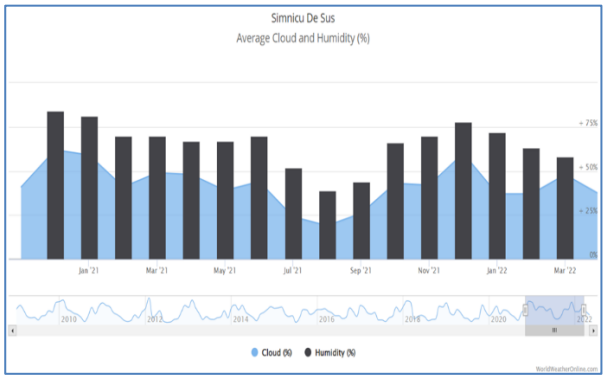

Figure 5 – Hygroscopicity and cloudiness values in Șimnicu de Sus during the experiment period

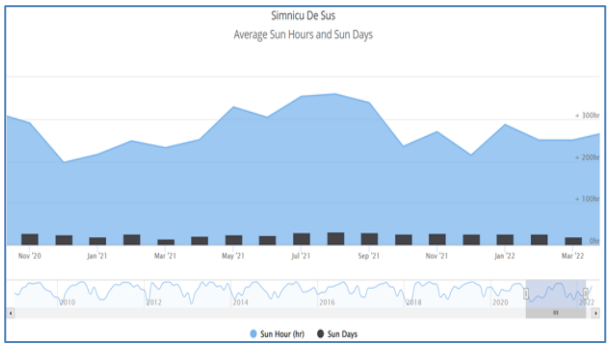

Figure 6 – Sun hours and Sun days in Șimnicu de Sus during the experiment period

The values of hygroscopicity (fig 5) and sunshine hours (fig6) indicate the favorability of the crop year for the vine, higher values of insolation and lower hygroscopicity being recorded between July and September, a fact that was found in the quantity and quality of the production obtained

Analysis of the biological indicators

The differences found in the length of matured and unmatured canes amongst the varieties under study are shown in Figure 7

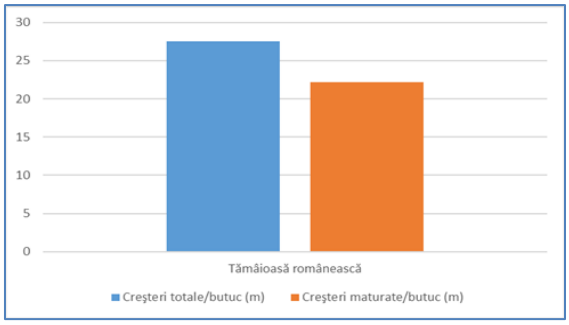

Figure 7 The length of the total and matured annual growths of canes

The length of the matured growths (80.72%) shows a good preparation of the wood for the following year

The determination of the viability of the buds

The values of the relative bud fertility coefficient vary depending on the genetic characteristics of the variety in question, the vegetative growths, as well as on the quantity and quality of last year metabolites, being determined by the ecoclimatic and pedological resources.

The determination of the viability of the buds was carried out in March, after the danger of severe frost had passed and before cutting, and aimed to determine the percentage of viable and dead buds, as well as their position on the strings in order to determine the fruit load and the length of the fruit elements .

Table 1. Bud viability

Number of buds studiedi	Number of live buds	Live buds (%)	Number of dead buds	Dead buds (%)
120	107	89,2	23	10,8

In the year 2021, for the grape variety for aromatic white wines Tâmiaoasa

Romanian, the viability had values of about 88.5% viable buds, (table 1). This high value was also due to the mild winter 2020/2021. The high value of viability allowed fruiting cuts to be made without problems

Analysis of the bioproductive parameters

The vine plants perceive the result of the interference of environmental factors and transmit it in the form of physiological reactions resulting in quantitative and qualitative changes of the chemical compositional units at the level of the whole organism and especially of the fruit.

The analysis of the behavior of the variety Tâmâioasă romțnească, highlights the dependence of reaching the moment of maturity on the environmental conditions that print a different degree of growth of the berries and accumulation of the contents in sugars and acidity.

Figure 8 shows the dynamic evolution of the weight and volume of the berries during ripening (from entering the field to harvesting)

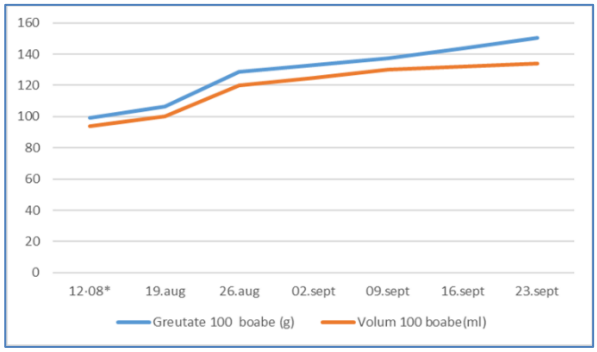

Figure 8 The dynamic evolution of the weight and volume of the berries during ripening

We can note that the lack of precipitation did not negatively influence the ripening process, in terms of quality parameters. This fact can be explained by the existence of a quantity of water in the soil, due to the significant amounts of precipitation from the previous months until that moment (80% of the total precipitation that fell this year during the conventional vegetation period).

Argument in this sense are the carbohydrate contents recorded on September 23 – 223 g/l, under the conditions of an acidity of 3.8 g/l H_2SO_4,- figure 9

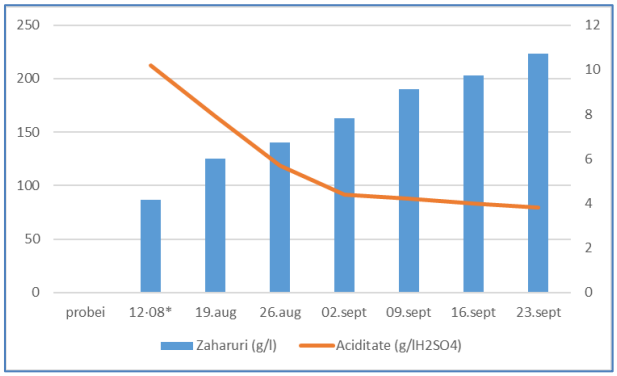

Figure 9 Evolution of sugar content and acidity of berries during maturation

The Tâmâioasa românească variety taken in the study demonstrated a high accumulation potential, the sugar parameter increasing by 136.9 g/l in the period 12.08-23.09 under the conditions of a final acidity of 3.8 g/l

The value of 58.8 of the gluco-acidimetric index indicates a good ripening of the grapes.

In the climatic context of 2021, insolation had the highest rate of participation in the development of physiological reactions generating a high level of quality, a result also influenced by the reduced amount of precipitation in the second part of the vegetation period

CONCLUSIONS.

Climate has a predominant role on the growth and development of grapevines. One of the most direct effects of climate change on grapevines is the change in onset phenology and the length of the growth season, which has further

influences on the grapevine metabolism, grape quality and productivity. The knowledge and modeling of those changes may be a key tool to plan viticultural management practices in the near future under variate climate scenarios.

An analysis of the results obtained under the conditions of Simnicu de Sus viticultural centre confirms the dependence of biochemical compound dynamics in grapes (accumulation of sugars, degradation of acids) on climatic resources, as well as with the intensity of different climatic determinants during ripening and maturation phenophases.

In Oltenia, the set of pedo-climatic conditions that favor the cultivation of vines and allow obtaining wines of exceptional quality, with typical characteristics for the Oltenia Hills, a region of which the Șimnicu de Sus commune is a part, are met. Grape production through rationally located plantations, according to the "vocation" of the land, can lead to remarkable results in obtaining wines with Designation of Controlled Origin (DOC) or Geographical Indication (IG).

The Tâmâioasă românească variety taken in the study demonstrated the normal course of the phenophases, a good ripening of the wood, a good viability of the buds, and a high accumulation potential of the chemical constituents that indicate the quality, the sugar parameter increasing by 136.9 g/l in the period during from entering the field to harvesting under the conditions of a final acidity of 3.8 g/l and a sugar content of over 220 g/l

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